

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

**PCT**

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

Date of mailing: 23 November 2000 (23.11.00)	
International application No.: PCT/IT99/00193	Applicant's or agent's file reference:
International filing date: 30 June 1999 (30.06.99)	Priority date: 14 May 1999 (14.05.99)
Applicant: STABILE, Aldo	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:  
08 September 2000 (08.09.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer:</p> <p>J. Zahra</p> <p>Telephone No.: (41-22) 338.83.38</p>
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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/IT 99/ 00193	International filing date (day/month/year) 30/06/1999	(Earliest) Priority Date (day/month/year) 14/05/1999
Applicant CADIF SRL et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

4

☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PC 99/00193

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F24D13/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F24D H05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 573 120 A (WANDELT) 30 October 1951 (1951-10-30) the whole document ---	1-3, 9, 12
A	DE 26 20 602 A (SCHMIEDGEN MARTIN) 1 December 1977 (1977-12-01) the whole document ---	1
A	WO 98 26222 A (FUJAS STEFAN) 18 June 1998 (1998-06-18) claims; figures ---	1, 20
A	DE 22 29 808 A (LUECKENHAUS FA PETER AUGUST) 7 March 1974 (1974-03-07) claims 1,5,12; figures -----	1-3



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

19/01/2000

Name and mailing address of the ISA

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Authorized officer

Van Gestel, H

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC 99/00193

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2573120	A	30-10-1951	NONE	
DE 2620602	A	01-12-1977	NONE	
WO 9826222	A	18-06-1998	HU 1068 U AU 4962597 A DE 19781409 D	28-05-1997 03-07-1998 02-09-1999
DE 2229808	A	07-03-1974	NONE	

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IT99/00193

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1-8 as originally filed

### Claims, No.:

1-24 as originally filed

### Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IT99/00193

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims 1-24
	No: Claims
Inventive step (IS)	Yes: Claims 1-24
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-24
	No: Claims

2. Citations and explanations  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Document US-A-2 573 120, which is considered as the closest prior art for the present application, discloses (see particularly figures 3, 4 and description thereof) a panel made with electrothermal fabric for generating and diffusing heat, the panel consisting of a heat-radiating board (4, 5) comprising electrothermal fabric with a weft weave of highly conductive wire (7), which is small in diameter and considerable in length, covered with insulating material (the tube 6 braided from glass fibres threads), having ends provided with electric contacts (7a), said board (4, 5) being completed by external layers of electrothermal material (8).

The subject-matter of claim 1, the only independent claim, differs from the known panel (Article 33(2) PCT) in that the weft weave is made by a continuous wire, which is coated with the insulating material, in that the board is completed by intermediate and external layers of thermoadhesive material and in that the board is covered on both surfaces by mica-based material.

These distinguishing features provide a cost-saving panel, because firstly they solve the technical problem of avoiding the low thermal efficiency and the complex construction of the known panel.

In the prior art there is not any suggestion in order to modify the known panel to arrive at the claimed invention, therefore the subject-matter of claim 1 involves an inventive step in the meaning of Article 33(3) PCT.

2. Claims 2-24 are dependent on claim 1 and as such they meet the requirements of Article 33(2) and (3) PCT.
3. The industrial applicability of the invention (Article 33(4) PCT) is clearly given in the description.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IT99/00193

**Re Item VII**

**Certain defects in the international application**

1. A document reflecting the prior art described on page 1, is not identified in the description (Rule 5.1(a)(ii) PCT).
2. In the present case, the two-part formulation of the claims seems to be misleading, therefore the one-part formulation appears the most appropriate (PCT Guidelines III-2.3). As explained under Item V, point 1, despite their position in the characterising part, some features are already known and, furthermore, they are interrelated with each others and with not known features in an inventive manner.
3. Some typographical mistakes are pointed out:
  - a) claim 1: line 30 of the page, "making";
  - b) page 1, line 22 "materials";
  - c) page 3, line 4, "energy";
  - d) page 5, line 24 "and".

**Re Item VIII**

**Certain observations on the international application**

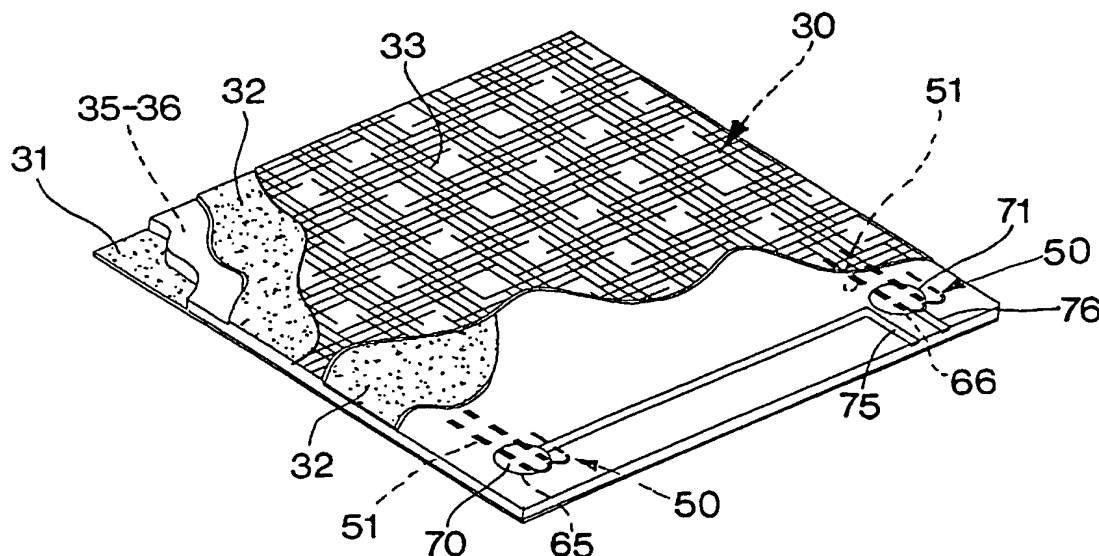
1. Claim 5 is not clear (Article 6 PCT), because in the last line it refers to a non better specified electric contact, which should be read as a different one from those already claimed at the beginning of the same claim, whereas from the description it appears that the same electric contact is meant.
2. Claim 11 is not clear contrary to the criteria of Article 6 PCT, because it depends on claim 9, whereas it refers to the halves of the frame, which are defined only in claim 10.
3. The claims as a whole are unclear (Article 6 PCT), when they are read in combination with the description, in particular page 2, line 15 - page 4, line 7. That is, it is not clear that the here described features are merely advantageous embodiments of the invention.



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : F24D 13/02	A1	(11) International Publication Number: <b>WO 00/70270</b> (43) International Publication Date: 23 November 2000 (23.11.00)
(21) International Application Number: PCT/IT99/00193 (22) International Filing Date: 30 June 1999 (30.06.99) (30) Priority Data: M199A001056          14 May 1999 (14.05.99)          IT (71) Applicant (for all designated States except US): CADIF SRL [IT/IT]; Via Monte Cervino, 2, I-37057 S. Giovanni Lupatoto (IT). (72) Inventor; and (75) Inventor/Applicant (for US only): STABILE, Aldo [IT/IT]; Via C. Uberti, 2, I-26013 Crema (IT). (74) Agent: DIGIOVANNI, Italo; Brevetti Dott. Ing. Digiovanni Schmiedt S.R.L., Via Aldrovandi, 7, I-20129 Milano (IT).	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published With international search report.	

(54) Title: PANEL MADE OF A HIGHLY INSULATED ELECTROTHERMAL FABRIC



## (57) Abstract

Panel (10) for generating and diffusing heat obtained from a heat-radiating board (30) comprising one or more pieces of electrothermal fabric with strips of fibreglass laid side by side to form the warp, the weft (50) consisting of a continuous copper wire (51), small in diameter and of considerable length, coated with insulating material, that extends serpentinewise passing alternatively above and below the strips of fibreglass, said board (30) being completed by intermediate and external layers (35, 36) of epoxidic thermoadhesive material and clad on both surfaces with sheets of micanite (31, 32), so that on connecting the ends of the wire (51) forming the weft (50) to a source of electric current, boring holes (65, 66) using means, that may be a laser beam, on the thermoadhesive layer (35, 36) covering the weft (50), this latter converts electric energy into thermal energy.

*FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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EE	Estonia						

10    **Panel made of a highly insulated electrothermal fabric**

The invention concerns means for generating heat for indoor use by electric current.

There are innumerable systems and means for generating heat for this purpose by electricity.

- 15    These systems are based on the use of highly resistant materials which, if electric current is passed through them, reach very high temperatures at a great concentration of heat.

Such heat is nearly always much more than the environment would require and must therefore be diffused by means of complex and

- 20    costly devices specially made for the purpose.

The high temperatures in the heat conductors render necessary certain means of support made of special and fragile materials such as ceramic and the like, and complex insulation and coating structures

- 25    These structures rapidly wear out because of the high temperatures they have to carry.

Thermal efficiency, especially if compared with other means of heating by fuels, is very low because of the high thermal difference between the electric resistances and room temperature

- 30    The means of heating are also bulky and, from the practical and aesthetic points of view, are difficult to combine with the furniture.

The above invention solves these problems, offering a means of electric heat that is flat, small in size and light in weight, as well as being highly insulated, as will be explained below.

Subject of the disclosure is a panel for generation and diffusion of  
5 heat having on it an electrothermal fabric, and a board of heat radiating material consisting of one or more pieces of said fabric.

Said fabric presents continuous weft wires, coated with highly insulating material and having electric contacts at their ends.

Intermediate and external layers of thermoadhesive material complete the board, covered on both sides by a mica-based material.  
10

By connecting the electric contacts to a source of electricity, the weft wires convert electric energy into thermal energy and, through the sheets of mica-based material, radiate heat throughout the environment.

15 The warp threads of the pieces of fabric consist of thin parallel threads of fibre glass laid side by side.

The weft wires run continuously from a first corner on a first side of the piece of fabric, crosswise to the warp threads, first passing above a first face of the first strip, above the second face of the next strip,  
20 above the first face of the strip next again, and so on till it reaches the opposite side of the piece.

From there, after making a bend at  $180^\circ$ , said wire returns to the first side, closely aligned the whole previously inserted length.

From this first side, after making a another  $180^\circ$  bend, said wire  
25 returns to the opposite side of the piece passing above the second face of the first strip, above the first face of the next strip, above the second face of the strip next again, and so on until the whole weft weave of the piece has been completed.

This way of laying of the conductor in lengths placed side by side,  
30 passed through by electric current in the opposite direction of flow, eliminates the electric fields.

Advantageously, the highly conductive weft wire is of copper.

The electric contacts are connected at the two ends of the wire that forms the weft weave, to be used to convert electric current into thermal energy, creating, by suitable means, a hole in the thermo-  
5 adhesive layer that covers one face of the electrothermic sheet.

This hole also passes through the insulation of the wire, a weld, or equivalent means, being put into said hole to connect said wire to an electric contact.

The hole may be produced by a grinder, by sanding or by a laser  
10 beam.

Being laser, said beam penetrates the insulating lining on the metal wire of the weft weave, but is repelled by the metal itself.

The heat radiating plate is mounted inside a protective frame.

This frame consists of two halves, of a constant section at an angle  
15 of 90°, shape and internal dimensions corresponding to the external dimensions and shape of the main parts of the panel, and being provided with means for a stable assembly.

The external dimensions of one half of the frame correspond to the internal dimensions of the other half.

20 The shape of the panel is preferably square.

The external sheets of the panel are of micanite. This consists of small flakes of mica glued onto paper or cloth.

In another execution the external sheets are of micarta. The supporting material for micarta is a fabric of fibreglass which can be  
25 impregnated with polyester or epoxy resins.

A thermal sensor is placed centrally on the heat radiating plate; its contacts can be connected to the two ends of a break in the continuous wire that forms the weft.

This sensor breaks the electric circuit of the heat-radiating plate  
30 when its temperature exceeds a certain level.

In one type of execution the heat-radiating sheet comprises two

superimposed pieces of electrothermal fabric with a thermoadhesive layer in between and at the ends.

The weft wires of the two pieces of superimposed fabric can be connected in parallel or in series.

- 5 The thermoadhesive material is preferably epoxidic.

The face of the heat-radiating board that will be on view can be covered with a sheet of decorative melamine.

The invention offers evident advantages.

- 10 In view of the nature of this mineral, the mica-based sheets, such a micanite, micarta and the like, ensure maximum electrical insulation and at the same time maximum diffusion of the heat on account of their being so thin, even only a few tenths of a millimetre thick, while at the same time ensuring good mechanical strength and maximum electrical insulation.

- 15 Comprising as it does one or more pieces of thermoelectric fabric with the weft weave formed of a highly conductive wire, the heat radiating plate also ensures maximum thermal efficiency, even though it is so thin, bulk and weight as well being minimum.

- 20 The width and length of the panel can be decided as preferred, to make it useful for a variety of purposes.

The possibility of applying a decorative sheet to the surface on view, or even of decorating the face of the mica-based material, helps to make the panel suitable for any environment and for placing in any position

- 25 Characteristics and purposes of the disclosure will be made still clearer by the following examples of its execution illustrated by diagrammatically drawn figures.

Fig. 1. Panel with a heat-radiating board comprising a piece of electrothermal fabric, with surrounding frame, perspective.

- 30 Fig. 2 Cross section of the panel.

Fig. 3 An exploded view of the panel.

Fig. 4 The heat-radiating board showing its component parts, perspective.

Fig. 5 Detail of the electrothermal fabric comprised in the heat radiating board.

5 Fig. 6 Detail of the heat-radiating board, a cross section.

Fig. 7 As above with a laser making a blind hole.

Fig. 8 As above, with an electric contact being welded into the blind hole.

Fig. 9 Heat-radiating board with two pieces of electrothermal fabric,  
10 perspective.

Fig. 10. Cross section of the board in Figure 9.

Fig. 11. The board in Fig, 9 with a laser beam making two blind holes facing in opposite directions.

Fig. 12. As above with an electric contact being welded into the  
15 blind holes.

The square panel 10 comprises the electrothermal sheet 30 protected by the frame 20 consisting of the two halves 21 and 22.

The half-frame 21 presents a front 23 and edge 26 at 90°.

The half frame 22 presents a front 27 and edge 28, also at 90°.

20 The external dimensions of the half-frame 22 correspond to the internal dimensions of the other half 21 so that one fits firmly into the other to form a stable frame.

The heat-radiating board 30 is formed of a piece 40 of special fabric placed between two layers, 35 and 36, of epoxidic thermoadhesive  
25 material and is clad on the two outer faces by pieces 31 and 32 of micanite.

A decorative sheet 33 of melamine paper is laid on the surface to remain on view.

The piece 40 of special fabric (Fig. 5) presents a warp 43-45 and a  
30 weft 50.

The warp is formed of parallel strips 43-45 laid side by side, each

strip being formed of fibreglass threads 46.

The weft 50 is formed of a continuous copper wire 51 coated with insulating paint 52.

The copper wire is inserted at one end, for example 55 (on the left  
5 low down in Fig. 5), of one side of the piece 40, crosswise to the  
fibreglass strips 43-45, passing alternatively on the first, on the  
second, on the first face, and so on, of the successive strips 43-45,  
emerging at the second end 56 (above, on the left, in the figure) of  
the opposite side of the piece, and after making an 180°-bend 57,  
10 returns into the piece alongside the first already mentioned length of  
wire so returning to the first side 55.

After making another 180° bend 58, it once more returns to the  
fabric, at a distance from the first length corresponding substantially  
to the width of the strips 43-45 as far as the opposite side of the  
15 piece 40, and so on to complete the weft as indicated, for example,  
by the end 53 of the wire.

It will therefore be seen that by joining electric contacts at any two  
points in the weft, obviously first removing the coating 52 on the  
copper wire 51, an electric circuit can be closed on the length of wire  
20 between said points so generating heat by converting electric  
energy into thermal energy.

Figures 6-8 show the method followed to do this.

The holes 65, 66 are made by the laser beam 60 on the surface of  
the thermoadhesive layer 36. Said beam perforates the thermo-  
25 adhesive layer 36 and the coating 52 on the copper wire 51.

The electric contacts 75, 76 can therefore be connected at the two  
ends of the length of copper wire between the two holes, by welds  
70, 71 made in the holes 65, 66.

Said contacts 75, 76 are connected to the electric wires 15, 16 that  
30 bring in mains electricity through the cable 17 and plug 18.

Figure 9 shows a heat-radiating board 80 comprising two pieces 40,



90 of special fabric with an intermediate layer 81 and two outer layers 82, 83 of epoxidic thermoadhesive material.

The board is clad on its two surfaces by pieces of micanite 31, 32.

Figures 9-12 show how mains electricity can be used to feed both  
5 the wefts 50 and 91 of copper wire in the pieces of fabric 40 and 90 by connecting the wires 15, 16 in the cable 17 to contacts 108, 109.

These contacts are fixed to said wefts 50 and 91 by welds 106, 107 (Figures 9 and 12) made inside the pairs of holes 95 and 97 in the two faces 85 and 86 of the plate 80 by laser beams 100 and 101 at  
10 the ends of said wefts 50 and 91.

By making further holes 96 and 98 (Figure 9) at the other ends of wefts 50, 91, and creating an electric bridge 105 to connect said ends by welds 102 and 103 made in said holes, wefts 50 and 91 become electrically connected in series.

15 Figure 9 shows, practically in the centre of the upper surface of the heat-radiating board 80, a discoid sensor 120 with switch whose contacts are connected to the two separated ends of the copper warp below said upper surface.

It follows that, when the temperature of the heat-radiating board  
20 exceeds a certain pre-set value in the sensor, the switch in said sensor automatically opens thus opening the electric circuit and preventing further generation of heat until the temperature has fallen to the pre-set level.

As will be seen in Figure 3, the electric cable 17, with plug 18,  
25 passes through the two opposite cavities, respectively 12 in the half frame 21 and 13 in the half frame 22.

On completing assembly, the panel appears as in Figure 1.

When the plug 18 is plugged in to an electric socket, the copper weft wires 50 and 91 in the pieces of thermoelectric fabric 40 and 80,  
30 receive current and heat up to a moderate temperature of about 100°C, the heat so generated, on passing through the micanite, is

radiated outwards from the panel to the environment as shown by the arrows 11.

The surface of the panel on view shows the decorative sheet of melamine 33.

- 5 Micanite is well known to be an insulating material consisting of a stiff or flexible sheet made from flakes of mica, of muscovite in particular.

To give it greater mechanical strength, micanite sheets may be made with the mica flakes glued onto paper or cloth. As an  
10 alternative, micarta may be used, this consisting of tiny flakes of pure mica mixed to form a paste without glue, then compressed and felted.

Micarta may be given a cloth or glass base or be impregnated with polyester and epoxy resins.

- 15 As the case may require, the sheets of micanite shown in the figures can therefore be replaced by sheets of micarta and the like.

CLAIMS

1. Panel (10) made with electrothermal fabric (40, 90) for generating and diffusing heat,  
characterized in that it consists of a heat-radiating board (30, 80)  
5 comprising one or more pieces of electrothermal fabric (40, 90), with a weft weave (50, 91) of continuous highly conductive wire (51) small in diameter and of considerable length, coated with insulating material (52) and having ends provided with electric contacts (75, 76, 105, 108, 109), said board (30, 80) being completed by intermediate (81) and external (35, 36, 82, 83) layers of thermoadhesive  
10 material and covered on both surfaces by mica-based material (31, 32) so that on connecting the contacts (75, 76, 105, 108, 109) to a source of electric current, the wire (51) forming the weft (50, 91), converts the electric energy into thermal energy and diffuses heat  
15 into the environment by radiation through the mica-based material (31, 32).
2. Panel (10) made with electrothermal fabric (40, 90) for generating and diffusing heat, as in claim 1,  
characterized in that the warp weave (43-45) of the pieces of fabric  
20 (40, 90) consists of parallel strips, laid side by side, formed of thin threads (46) of fibreglass.
3. Panel (10) made with electrothermal fabric (40, 90) for generating and diffusing heat, as in claims 1 and 2,  
characterized in that the wire (51) constituting the weft (50, 91)  
25 extends continuously from a first corner on a first side (55) of the piece (40, 90) of fabric, crosswise to the warp strips (43-45) passing alternatively over a first face of the first strip (43), over the second face of the next strip (44), over the first face of the strip next again and so on to reach the opposite side (56) of the piece (40, 90) and  
30 from there, after making a bend (57) at 180°, said wire (51) returns towards the first side (55) closely aligned along the whole of the

previously inserted length and, from this first side (55) said wire (51) makes a bend (58) at 180° and returns towards the opposite side (56) of the piece (40, 90) passing over the second face of the first strip (43), over the first face of the next strip (44), over the second  
5 face of the strip next again and so on, to complete the whole weft (50, 91) of the piece (40, 90), the effect of aligning the lengths of conducting wire (51), through which electric current passes in the opposite direction of flow, being to eliminate electric fields.

4. Panel (10) made with electrothermal fabric (40,90) for generating  
10 and diffusing heat, as in claim 1,  
characterized in that the highly conductive wire (51) of the weft weave (50) is of copper.

5. Panel (10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 1,  
15 characterized in that the electric contacts (75, 76, 105, 108, 109) are joined at the two ends of the wire (51) that makes the weft (50, 91) and that are to be used for transforming electric current into thermal energy, a hole (65-66, 95-98) being made by suitable means (60, 100, 101) in the thermoadhesive layer (36, 82, 83) which covers one  
20 or both surfaces of the electrothermal board (30, 80), said hole (65,66, 95-98) also comprising the insulating coating (52) on the wire (51), a weld (70, 71, 102, 103, 106, 107) or equivalent means being made in said hole (65-66, 95-98) to connect said wire (51) to an electric contact (75, 76, 105, 108, 109).

25 6. Panel (10) made with electrothermal fabric (40,90) for generating and diffusing heat, as in claim 5,  
characterized in that the hole (65-66, 95-98) is made by a grinder.

7. Panel (10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 5,  
30 characterized in that the hole (65,66, 95-98) is made by sanding.

8. Panel (10) made with electrothermal fabric (40,90) for generating

- and diffusing heat, as in claim 5,  
characterized in that the hole (65,66, 95-98) is made by a laser  
beam (60, 100,101) the nature of which causes it to penetrate the  
insulating coating (52) on the wire (51) forming the weft (50,91) but  
5 then be repelled by the metal of the wire (51).
9. Panel (10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 1,  
characterized in that the heat-radiating board (30, 80) is mounted  
inside a protective frame (20).
- 10 10. Panel (10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 9,  
characterized in that the frame (20) is made of two opposing halves  
(21,22) of a constant section in accordance with an angle of 90°,  
having internal shapes and dimensions corresponding to the  
15 external shapes and dimensions of the internal parts (30) of the  
panel (10) and being provided with means for stable assembly.
11. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 9,  
characterized in that the external dimensions of one half (22) of the  
20 frame correspond to the internal dimensions of the other half (21).
12. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 1,  
characterized in that it is square in shape.
13. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 1,  
25 characterized in that the outer sheets (31, 32) are of micanite.
14. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 13,  
characterized in that the micanite (31, 32) is made from flakes of  
30 mica glued onto paper or cloth (33).
15. Panel(10) made with electrothermal fabric (40,90) for generating

and diffusing heat, as in claim 1,  
characterized in that the outer sheets (31,32) are of micarta.

16. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 15,

5 characterized in that the micarta (31,32) is applied to a base of  
fibreglass.

17. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat, as in claim 15,

characterized in that the micarta (31, 32) is impregnated with poly-  
10 ester or epoxy resins.

18. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat as in claim 1

characterized in that a thermal sensor (120) is placed in a central  
position on the heat-radiating board (30, 80), it being possible to join  
15 the ends of said sensor to the two ends of an interruption in the  
continuous wire (51) that forms the weft weave (50, 91), said sensor  
(120) breaking the electric circuit of the heat-radiating board (30, 80)  
when its temperature rises above a certain level.

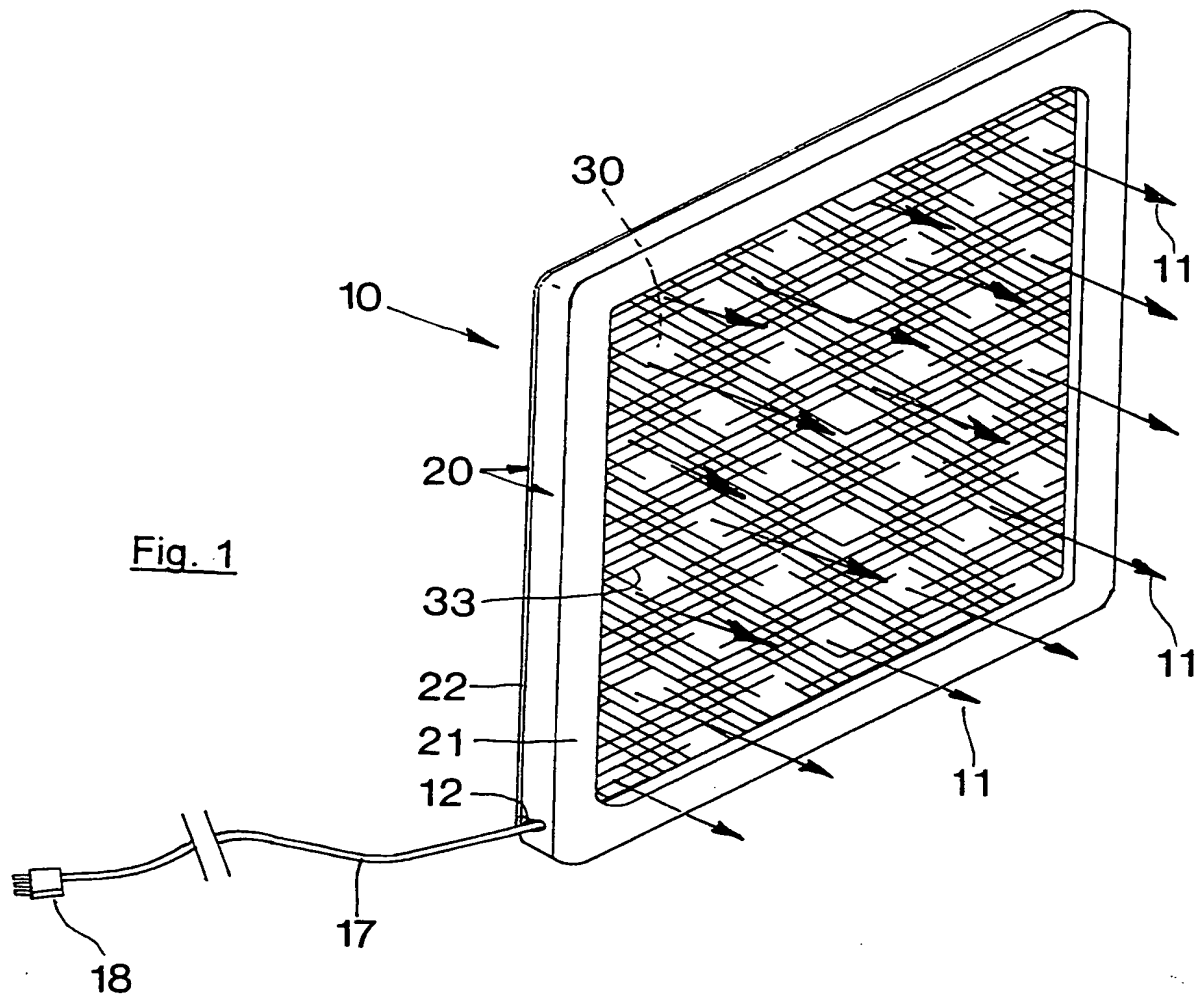
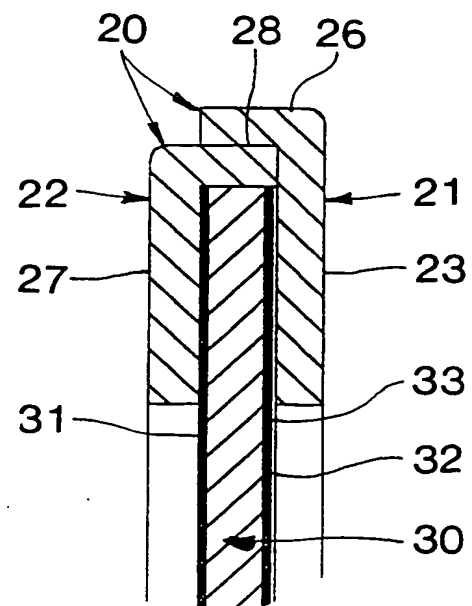
19. Panel (10) made with electrothermal fabric (40,90) for generating  
20 and diffusing heat as in claim 1,

characterized in that the wire (51) that creates the weft (50, 91) is  
continuous over substantially two halves of the piece of fabric, the  
ends of the copper wire (51), that corresponds to said two halves,  
being connected to a thermoelectric sensor (120) that automatically  
25 turns electric current off in that half of the piece in which the pre-set  
temperature level may have been exceeded.

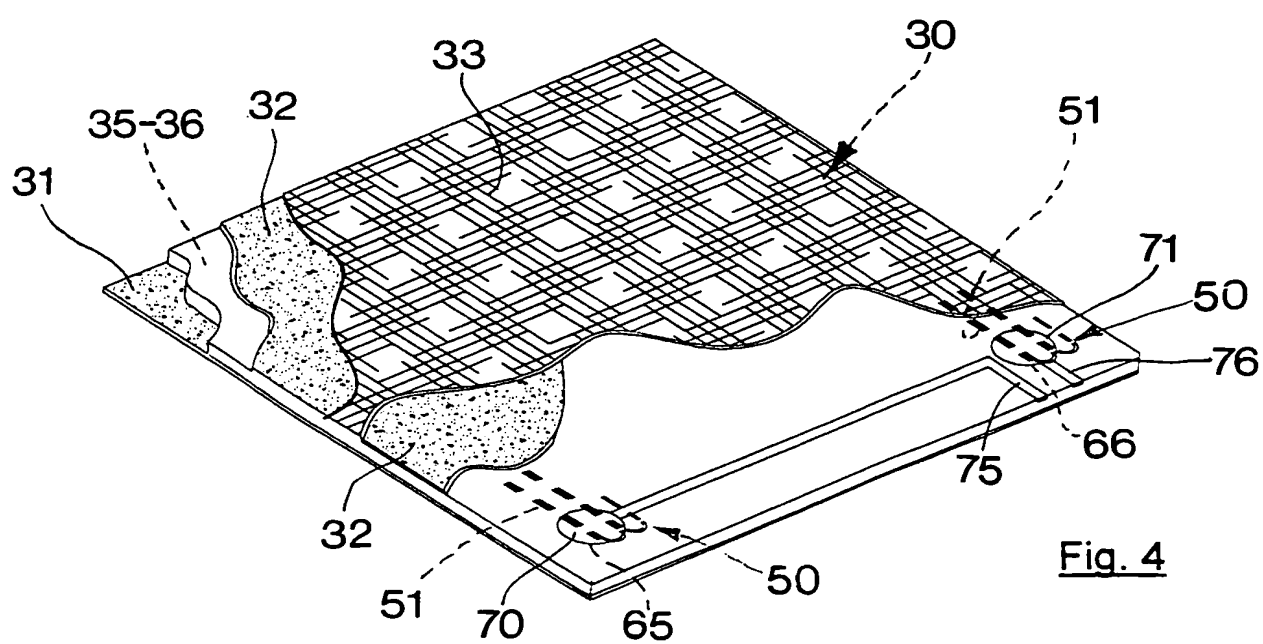
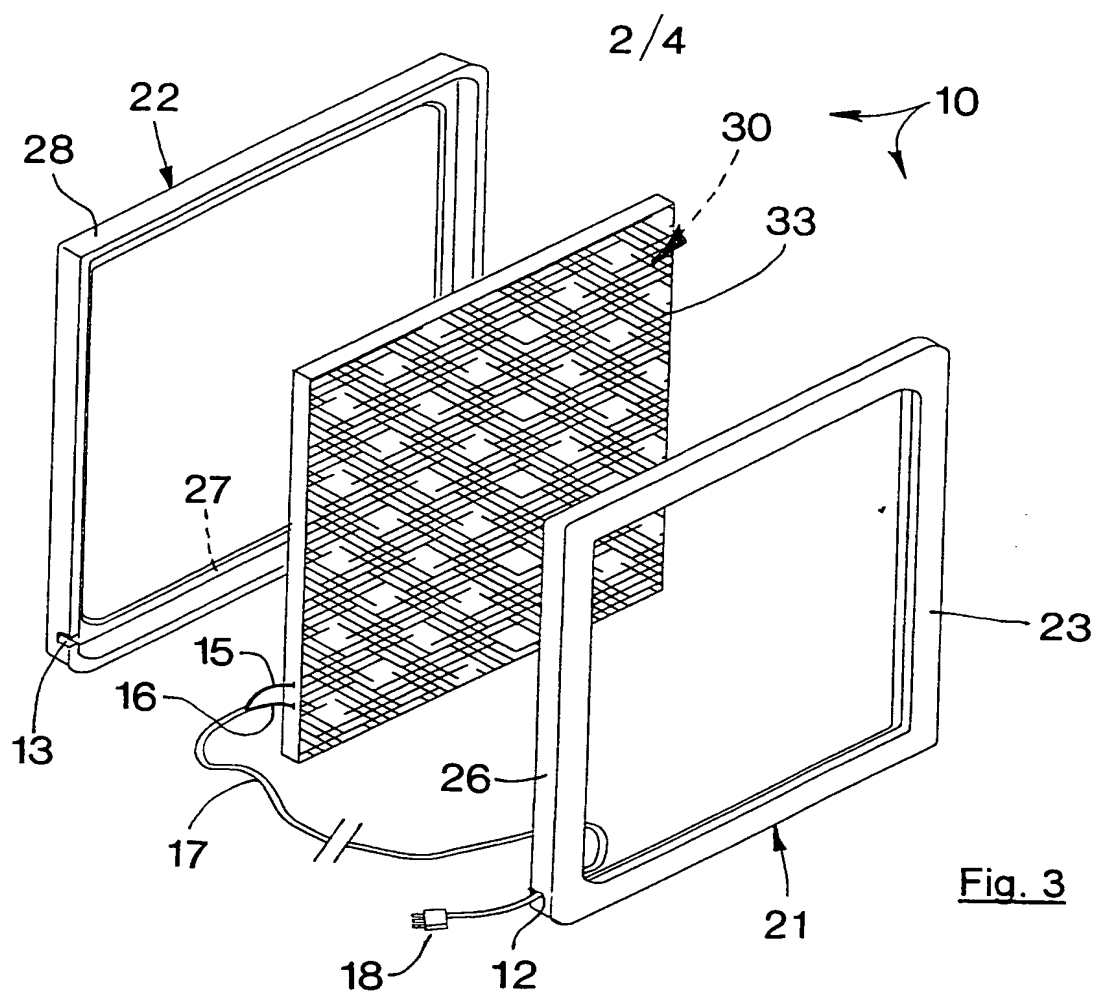
20. Panel(10) made with electrothermal fabric (40,90) for generating  
and diffusing heat as in claim 1,  
characterized in that the heat-radiating board (80) comprises two  
30 pieces of electrothermal fabric (40, 90), superimposed and with  
thermoadhesive layers in between (81) and at the ends (82, 83).

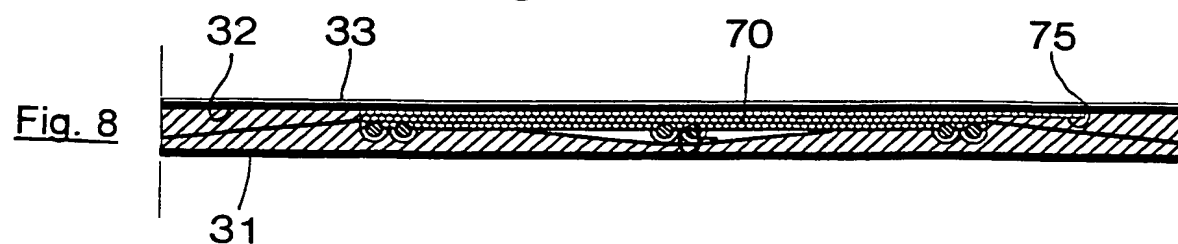
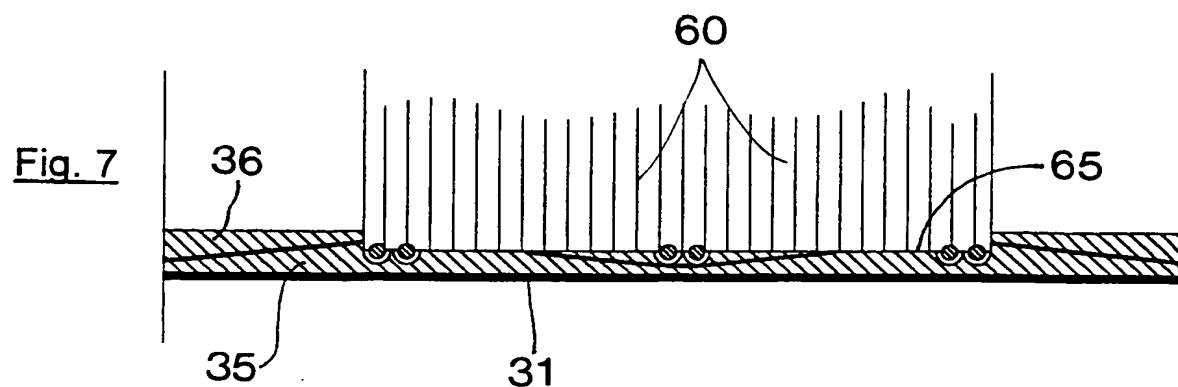
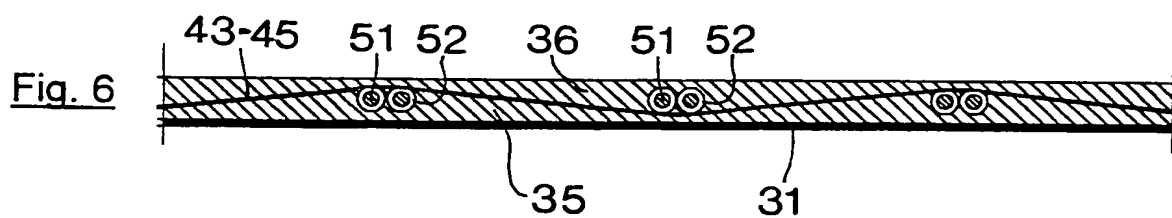
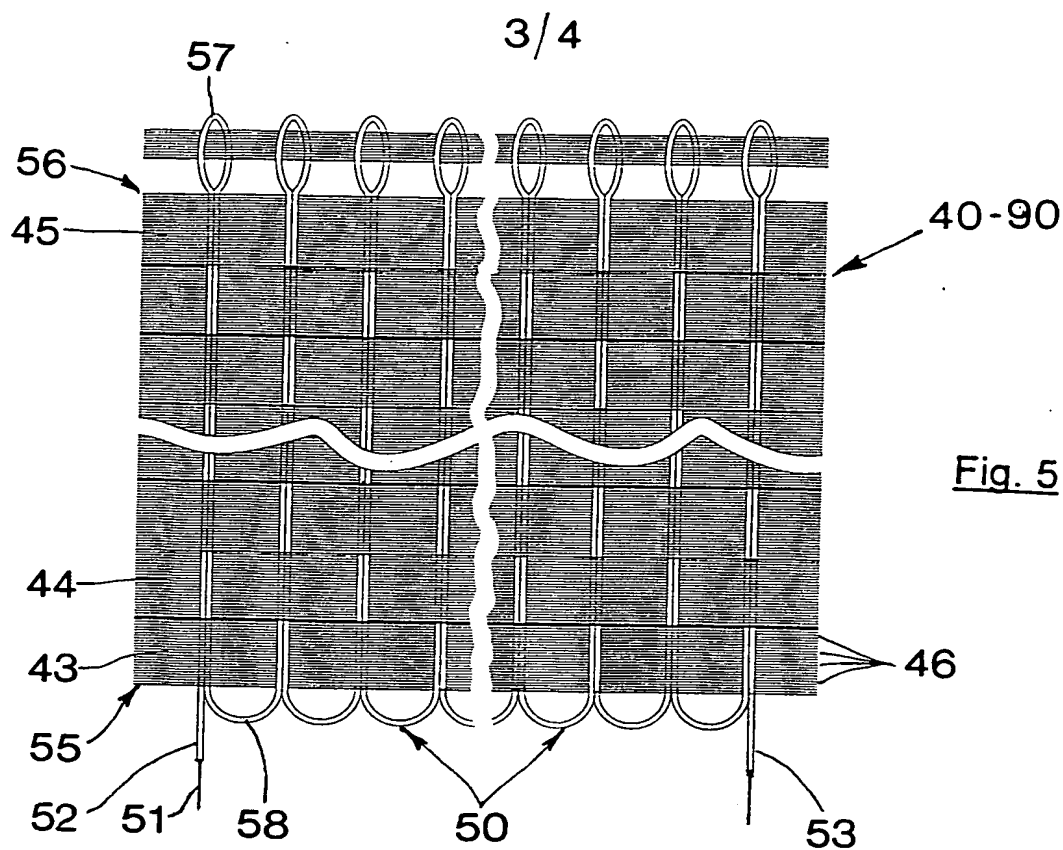
21. Panel(10) made with electrothermal fabric (40,90) for generating and diffusing heat, as in claim 20,  
characterized in that the wires (51) forming the weft (50, 91) of the two superimposed pieces of fabric (40, 90) are connected in parallel.
- 5 22. Panel(10) made with electrothermal fabric (40,90) for generating and diffusing heat, as in claim 20,  
characterized in that the wires (51) forming the weft (50,91) of the two superimposed pieces of fabric (40,90) are connected in series.
- 10 23. Panel(10) made with electrothermal fabric (40,90) for generating and diffusing heat, as in claims 1 and 20,  
characterized in that the thermoadhesive material (35, 36, 81-83) is epoxidic.
- 15 24. Panel(10) made with electrothermal fabric (40,90) for generating and diffusing heat, as in claim 1,  
characterized in that the surface of the head-radiating board (30, 80) to remain on view is covered with a sheet (33) of decorative melamine.

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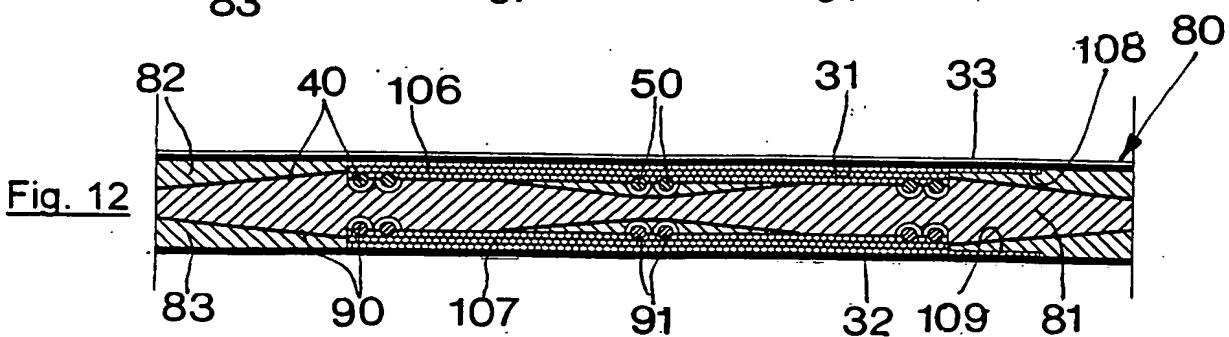
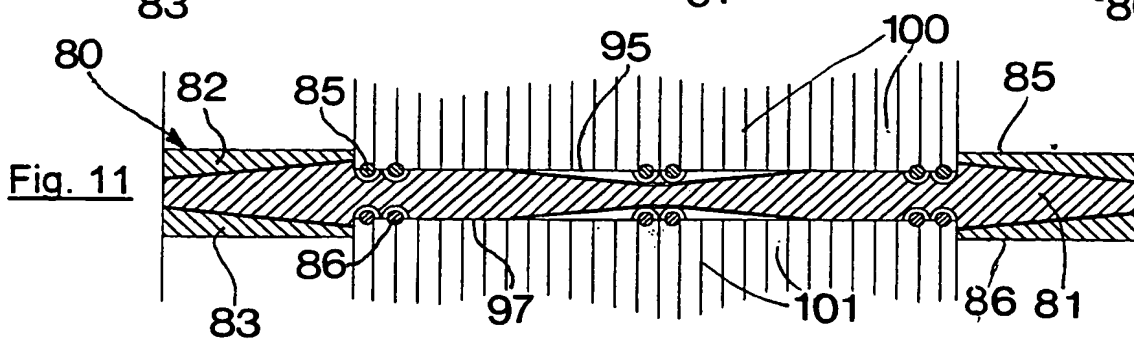
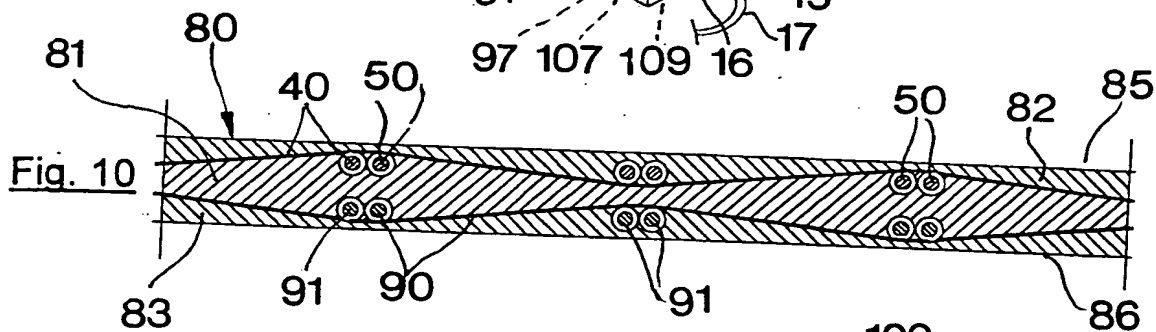
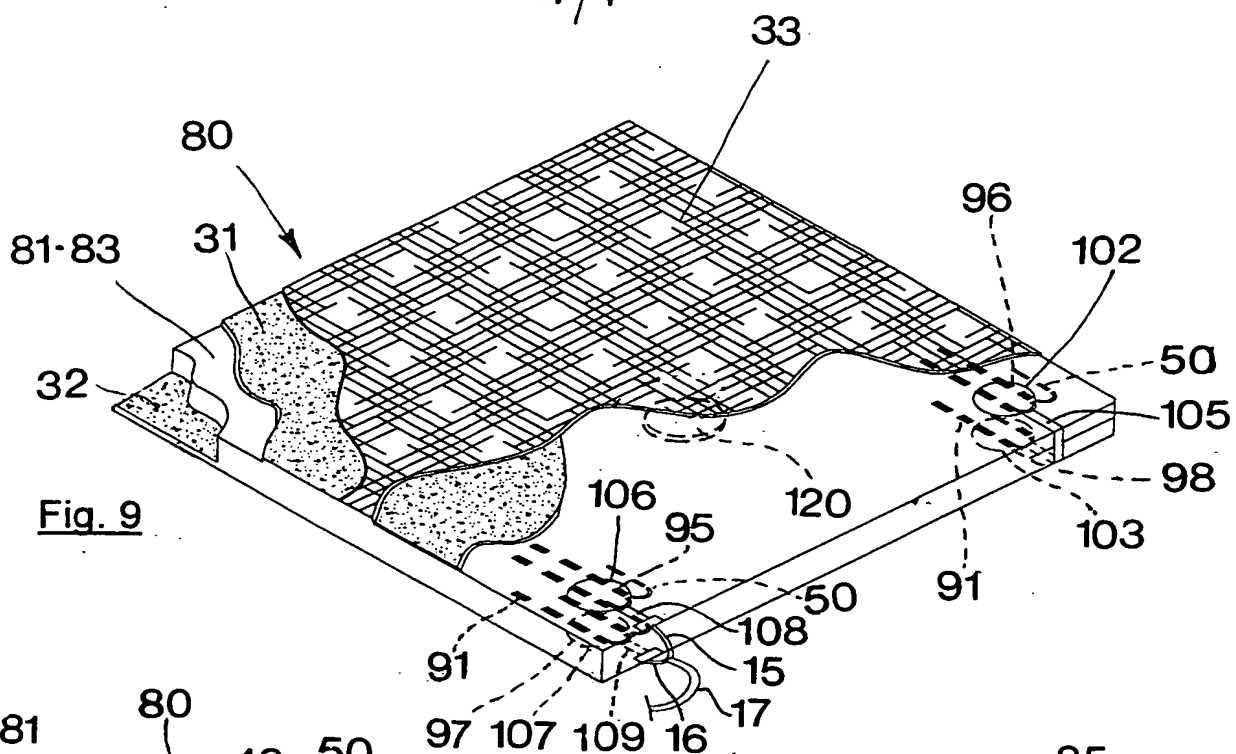
Fig. 2







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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 99/00193

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F24D13/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F24D H05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 573 120 A (WANDEL) 30 October 1951 (1951-10-30) the whole document ---	1-3, 9, 12
A	DE 26 20 602 A (SCHMIEDGEN MARTIN) 1 December 1977 (1977-12-01) the whole document ---	1
A	WO 98 26222 A (FUJAS STEFAN) 18 June 1998 (1998-06-18) claims; figures ---	1, 20
A	DE 22 29 808 A (LUECKENHAUS FA PETER AUGUST) 7 March 1974 (1974-03-07) claims 1.5, 12; figures -----	1-3

☐ Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

19/01/2000

Name and mailing address of the ISA

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Authorized officer

Van Gestel, H

# INTERNATIONAL SEARCH REPORT

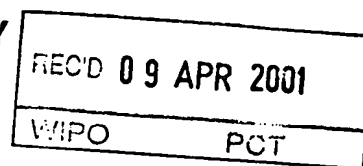
Information on patent family members

International Application No

PCT/IT 99/00193

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2573120	A	30-10-1951	NONE	
DE 2620602	A	01-12-1977	NONE	
WO 9826222	A	18-06-1998	HU 1068 U AU 4962597 A DE 19781409 D	28-05-1997 03-07-1998 02-09-1999
DE 2229808	A	07-03-1974	NONE	

# PCT



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)


Applicant's or agent's file reference J.	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IT99/00193	International filing date (day/month/year) 30/06/1999	Priority date (day/month/year) 14/05/1999
International Patent Classification (IPC) or national classification and IPC F24D13/02		
Applicant CADIF SRL et al.		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.
  - ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  08/09/2000	Date of completion of this report  04.04.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Vecchio, G  Telephone No. +49 89 2399 7325 